Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

ANNUAL REPORT 1981

MINERAL RESOURCES DIVISION
GEOLOGICAL BRANCH

May 1982

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BY
By A. Sutherland Brown

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GEOLOGICAL BRANCH

GOAL AND OBJECTIVES

Metals, nonmetallic minerals, and coal are nonrenewable judged by the scale of man's lifetime. The Province's needs for these commodities for our own use and for export are fulfilled only by continuous exploration and discovery. The fundamental role of the Geological Branch is to facilitate the renewal process and the orderly development of the solid mineral resources. To do this, the detailed objectives of the Geological Branch are as follows:

(1) To provide perceptive geoscientific mapping, surveys, and related research in order to stimulate and facilitate effective exploration, discovery, and production of the Province's mineral and coal resources.

(2) lb develop regional geological expertise to facilitate orderly resource development and management.

(3) To develop supply side mineral commodity and coal expertise for advice to government and industry.

(4) To monitor mineral industry activities to provide timely information to government and industry on the intensity and distribution of exploration for resource management and orderly development.

(5) To aid prospectors, explorationists, and developers by providing technical assistance and information in the field to facilitate more effective exploration and development.

(6) To administer *the Mineral Prospectors dct* so as to train prospectors and review and provide grants to individual prospectors.

(7) To acquire, approve, store, analyze, and disseminate geoscience data for coal and minerals in order to provide a superior and comprehensive inventory for government, industry, and public use and in so doing to increase exploration efficiency by avoiding costly duplication of effort.

(8) lb ensure that mineral lands are properly managed in relation to competing land uses and that thorough office and field assessments of mineral potential are carried out before alienation of mineral lands from exploration is approved.

(9) To maintain an effective analytical laboratory to provide chemical support for geoscience and prospecting activities.

(10) lb provide standards for the quality of analysis of geological materials and to develop and demonstrate new methods for commercial and mine laboratories.

ORGANIZATION

To carry out the objectives, the Branch is organized into four sections: Geoscience Projects, Applied Programs, Resource Data and Analysis, and Analytical Laboratory, the work of which is described subsequently as shown on Figure 1 with tasks as shown in Table 1.

TABLE 1

MINERAL RESOURCES

GEOLOGICAL BRANCH MANAGEMENT AND ORGANIZATION MATRIX

DISCIPLINES AND FIELD OF INTEREST	ORGANIZATION AM) PROGRAM RESPONSIBILITY			
	PROJECT	APPLIED	RESOURCE DATA	LAB.
RESOURCE TYPE				
Metallic	•	*	*	•
Nonmetallic		•		
Coal	•	*	•	*
Geothermal				
RESEARM AM DEVELOPMENT				
Geoscience research	*	+		
Geological surveys	•			
Geochemical surveys and control	*			•
Analytical method development				•
FUNCTIONS				
Land-use analysis and management		+	•	
Resource Inventory analysis and management		+	•	
industry Intel ligence	+	•	*	
Consultation service	•	•	*	+
Data process ing			•	
[illegible]		•		
Prospector training	+	•		
Geologist training	*			
Assayer certification				*

• = MAJOR ROLE; + = IMPORTANT ROLE; - = MINOR ROLE; (blank) = NIL.

STAFF

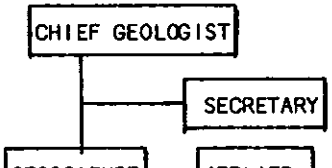
The staff establishment on December 31, 1981, included 54 permanent positions, 10 of which were vacant. Staff turnover therefore was a serious impediment to successful implementation of the objective of the Branch. Nine and a half man-years of continuing auxiliary or contract staff helped the Branch function but most were in junior capacitites. The vacant positions included the following: senior staff - the Manager and Assistant Manager of Applied Programs and the Senior Land-Use Geologist. However, at the end of the year, seven of these positions were advertised and under competition.

FIGURE 1

ORGANIZATION, MANPOWER. BUDGET

GEOLCG ICAL BRANCH

31st December. 1981



STAFF		RESOURCE DATA AND ANALYSIS	GEOSCIENCE PROJECTS	APPLIED PROGRAMS	ANALYTICAL LABORATORY	GENERK MANAGEMENT	BRANCH TOTAL
PERMANENT		9	16	7	10	2	44 man-years
VACANT		3	2	5	0		10 man-years
AUXILIARY:	CONTINUING	5 1/2	1	3	2		10 1/2 man-years
	SUMMER	3 1/2	5	1/2	1/2		9 1/2 man-years
BUDGET:	80/81	$420.8K	*1894.X*	$498.6K	$344.7K	$100.4K	$2 229.8K
	81/82	$656.2K	1856.X	$530.8K	$393.5K	$101.2K	$2 558.6K

SUPPLEMENTARY PROGRAMS

	COMPUTERIZING COAL INVENTORY	REGIONAL GEOCHEMICAL SURVEYS RELATED RESEARCH	PROSPECTORS' ASSISTANCE	
80/81	$61.5K	$410.0K	$283.2K	$754.7K
81/82	0	$372.9K	$310.0K	$682.9K

GRAND TOTAL 80/81 $2 984.5K
81/82 $3 241.5K

The permanent establishment included 29 geoscientists, 6 analytical chemists, 14 technicians and technical assistants, and 6 office assistants.

The contract and continuing auxiliary staff included the following man-years: 3.5 geoscientists, 1 chemist, 4 technical assistants, and 2 office assistants. The chemist was Mr. Paul Riehm, on sabbatical leave from Mohawk College, Hamilton, Ontario.

The professional, technical, and supervisory staff at December 31, 1981, was as follows:

A. Sutherland Brown, Ph.D., P. Eng.	Chief Geologist

GEOSCIENCE PROJECTS

W. J. McMillan, Ph.D., P. Eng.	Manager
D. Alldrick, M.Sc.	Project Geologist
B. N. Church, Ph.D., P. Eng.	Senior Project Geologist
G.E.P. Eastwood, Ph.D., P. Eng.	Senior Project Geologist
T. Höy, Ph.D., P. Eng.	Senior Project Geologist
D. G. Macintyre, Ph.D., P. Eng.	Project Geologist
A. Panteleyev, Ph.D., P. Eng.	Senior Project Geologist
V. A. Preto, Ph.D., P. Eng.	Senior Project Geologist
G. E. Ray. Ph.D., P. Eng.	Project Geologist
Vacant	Geologist
vacant	Geologist
J. L. Armitage	Chief Draughtsman
R. E. Player	Lap idary and Photographer

APPL I ED PROGRAMS

Vacant	Manager
Vacant	Deputy Manager
G. G. Addle, M.Sc., P. Eng.	District Geologist, Nelson
D. A. Grieve, M.Sc.	District Geologist, Fernie
vacant	District Geologist, Fort St. John
vacant	District Geologist, Prince George
T. G. Schroeter, M.Sc., P. Eng.	District Geologist, Smithers
G.P.E. White, B.Sc., P. Eng.	District Geologist, Kamloops
G. V. White, B.Sc.	Engineering Assistant, Fort St. John

RESOURCE DATA AND ANALYSIS

J. G. McArthur, M.Sc.	Manager
Z. D. Hora, M.Sc.	Industrial Minerals Geologist
vacant	Senior Land-Use Geologist
Vacant	Resource Analyst Geologist
T. E. Kainins, B.A.Sc., P. Eng.	Geologist
Allan Wilcox, B.Sc.	MI nera I I nventory Systems Geologi st
vacant	Mineral Inventory Geologist

(Continued)

RESOURCE DATA AND ANALYSIS (CONTINUED)

A. Matheson, B.Sc.	Coal Resources Geologist
C. Kenyon, B.Ed., B.Sc.	Coal Inventory Systems Geologist
C. Sturko, B.A.	Englneerlng Aide
J. Young, B.A.*	Engineering Aide
J. Thompson, B.A.*	Engineering Aide
N. McKechnie*	Consultant, Report Review
C. Ritchie	Resource Data Information Officer

ANALYTICAL LABORATORY

W. M. Johnson, Ph.D.	Chief Analyst and Manager
P. F. Ralph, L.R.I.C.	Deputy Chief Analyst
B. Bhagwanani, B.Sc	Laboratory Scientist
R. J. Hibberson, B.Sc.	Laboratory Scientist
Y.T.J. Kwong, M.Sc.	Laboratory Scientist
V.V.B. Vilkos, Ph.D.	Laboratory Scientist
M. A. Chaudhry	Laboratory Technlclan
F. F. Karpick	Laboratory Technician
L. E. Sheppard	Laboratory Technlclan

*Contract

STAFF CHANGES

The serious staff turnover that started in 1980 continued through 1981, but by the end of the year, five positions had been filled and seven were advertised. Some of the vacancies that occurred in 1981 were the result of resignations at the end of 1980. These included: Dr. E. W. Grove, Manager of Applied Programs, who left to set up his own consulting practice; Dr. D. E. Pearson, Senior Project Geologist, who did likewise; and Mr. R. Ii. Karst, District Geologist at Charlie Lake, who left to become Senior Mine Geologist at Manalta Coal Ltd. at Hinton, Alberta. In addition, Mr. R. D. Gilchrist, Coal Project Geologist, left for Crows Nest Resources Ltd.; Mr. G. H. Klein, District Geologist, Prince George, left to form a company Northgane Minerals; and Mr. J. E. Forester, Mineral Inventory Geologist, left because of health reasons.

The Branch was fortunate to attract three promising new staff during the year and appointed two after several years of service in auxiliary positions. Geoscience Projects acquired the services of Dr. G. E. Ray from Energy Reserve Corp., Calgary and Mr. D. Alldrick from Pine Point Mines Ltd. Mr. Allan Wilcox came from the Department of Indian Affairs and Northern Development, Ottawa, to join the Mineral Resource Inventory. In addition Candace Kenyon was appointed Research Officer and Claudia Sturko, Engineering Assistant, in the Coal Resource Inventory.

Mr. A. F. Shepherd, recently retired as Assistant Manager of Applied Programs, returned on contract to act as Manager. Mr. G. V. White, Engineering Assistant at Charlie Lake, returned to the University of British Columbia on leave of absence to finish his B.Sc.

THE WORK OF THE BRANCH

The distribution of major projects in 1981 and of district offices, regional geochemical surveys, and map-areas are shown on Figure 2 and the projects are summarized in Table 2.

TABLE 2

MAJOR PROJECTS IN 1981

	PROJECT AND COMMODITY	NTS AREA	MAP PUBLICATION SCALE	PRINCIPAL INVESTIGATORS
(a)	Cassiar precious metal deposits (Au, Ag)	104	1:25 000	A. Panteleyev and L. J. Diakow
(b)	Toodoggone volcanic rocks (Au, Ag)	94	1:25 000	T. G. Schroeter*, A. Panteleyev, and L. J. Diakow
(c)	Northeast British Columbia lead and zinc resources. Akie River area	94	1:50 000	D. G. MacIntyre, D. Lowey, and L. J. Diakow
(d)	Correlation in Northeast Coalfield - palynology of coal measures	94		J. Broatch
(e)	Gravity survey of Tulameen coal Basin	92	1:25 000	B. N. Church
(f)	Coquihalla Ultramafic Belt gold deposits	92	1:25 000	G. E. Ray
(g)	Tertiary Intermontane Basins - energy and mineral resources	Various	1:50 000	B. N. Church
(h)	Sicker Group (Cu, Zn, Au. Ag)	928	1:25 000	G.E.P. Eastwood
(i)	Southeast Coalfield	82G	1:25 000	D. A. Grieve'
(j)	Carbonatites near Blue River	83D		G.P.E. White*

* District Geologist

GEOSCIENCE PROJECTS

The work of this section is devoted principally to geological mapping of areas important for mineral resources and for research leading to better understanding of the origin and distribution of mineral deposits. The intention of so doing is to fulfill the first three objectives of the Branch. The products of field mapping and related research are known to have the highest priority with the Branch's main user, the exploration industry. The Branch also conducts, with the help of the Analytical Laboratory, the regional geochemical reconnaissance surveys that have

proven very useful for both exploration and environmental baseline studies. The section under W. J. McMillan, mounted main field projects listed in Table 2 with their distribution shown on Figure 2.

Budget estimates for the section included $511 638 in permanent salaries and $345 081 for field and all other costs. The Regional Geochemical Survey had a budget of $302 900, and grants to university projects had $70 000.

The geological studies conducted principally by project geologists were augmented by similar work by district geologists and laboratory scientists. Cooperative studies included: coal sampling on Vancouver Island by G.E.P. Eastwood and in the Groundhog area by G. Gilchrist and A. Matheson; mapping - Barriere area by V. A. Preto and P. Schiarizza; mapping and mineral deposit studies - Cassiar area by A. Panteleyev and L. Diakow, Toodoggone area by T. Schroeter, A. Panteleyev, and L. Diakow, and in Kwadacha Park by D. MacIntyre and L. Diakow; lithogeochemical study - in Akie River area by D. MacIntyre and J. Lowey; several Project Geologists are also working jointly on studies, for example, T. Höy and D. MacIntyre on lead-zinc deposits in the Eastern Cordillera, and B. N. Church and G.E.P. Eastwood on fault definition using gravity methods.

GEOSCIENCE PROJECTS EXTENSION

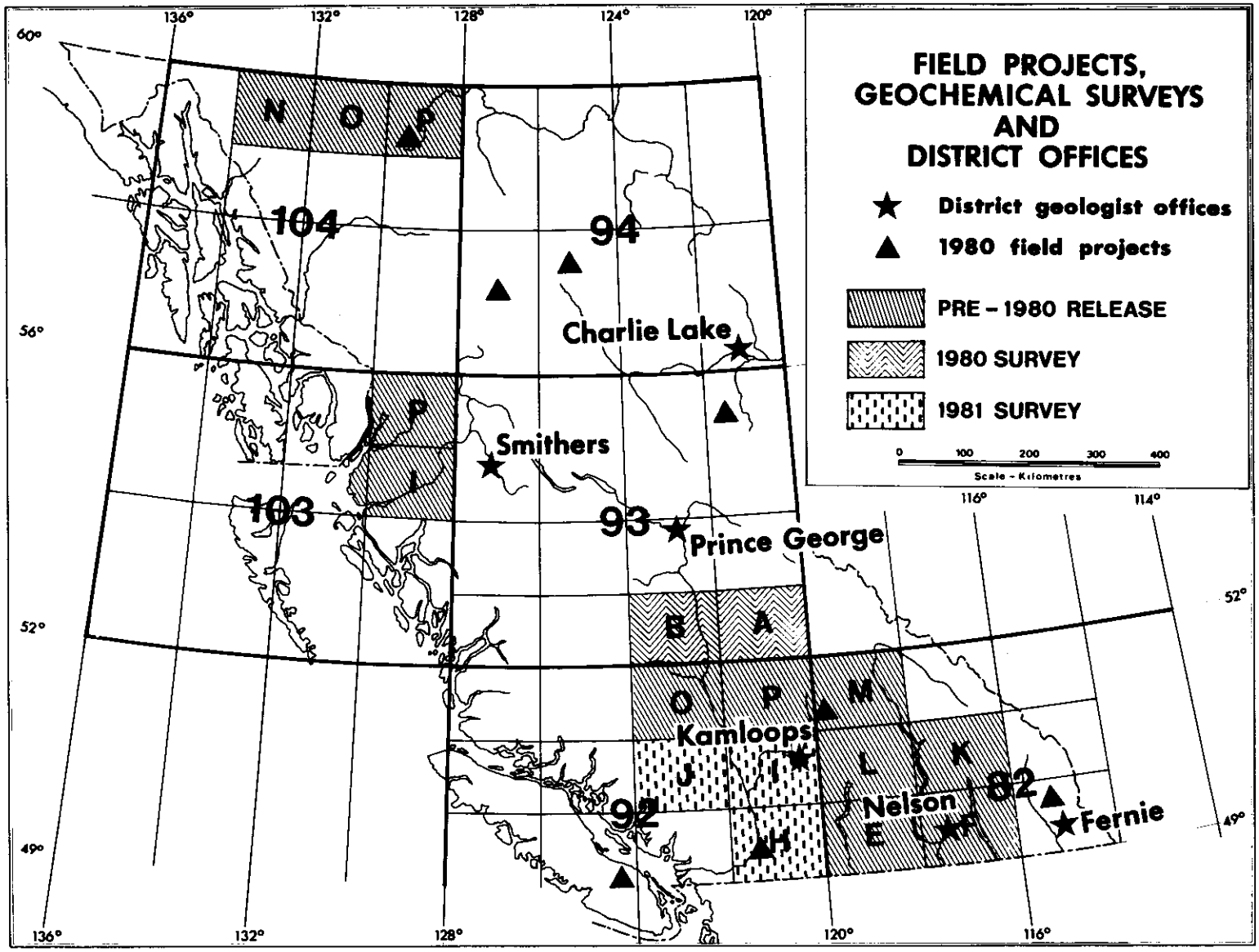
The Regional Geochemical Survey in 1981 of Hope (92H), Ashcroft (92I), and Pemberton (92J) areas (see Fig. 2) was done by a series of separate contracts with planning supervision and control provided by the Branch. Considerable help in data handling was received from the Geological Survey of Canada.

Valuable additional work was also conducted by professors and graduate students at the University of British Columbia with the aid of grants from the Ministry. Many of these studies were directly relevant to Branch projects and some were cooperative. The university studies included:

Sinclair, A. J.: Multivariate Models for Relative Mineral Potential, Slocan Silver-Lead-Zinc-Gold Camp (82F).

Matysek, P., Sinclair, A. J., and Fletcher, W. K.: Rapid Anomaly Recognition and Ranking for Multi-element Regional Stream Sediment Surveys.

Andrew, A., Godwin, C. I., and Sinclair, A. J.: Preliminary Examination of Gold Metallogeny in the Insular Belt of the Canadian Cordillera using Galena-Lead Isotope Analyses.


FIELD PROJECTS, GEOCHEMICAL SURVEYS AND DISTRICT OFFICES
District geologist offices
1980 field projects
PRE – 1980 RELEASE
1980 SURVEY
1981 SURVEY
0 100 200 300 400
Scale - Kilometres
136°
132°
128°
124°
120°
116°
114°
60°
56°
52°
49°
104
94
103
93
92
82
N O P
K L M
B A
O P M
J I L K
E H F
Charlie Lake
Smithers
Prince George
Kamloops
Nelson
Fernie

represent the Ministry in regional resource committees. Four of the six district offices operated normally in 1981 but activity in the other two, in Fort St. John and Prince George, was seriously curtailed due to resignation of the incumbents. Highlights of the active districts include the following:

(1) T. G. Schroeter, Smithers, managed not only to visit properties all around the vary active, large, northwestern district but also to lead in development exploration concepts of the Toodoggone gold-silver camp in cooperation with A. Panteleyev and L. Diakow.

(2) G.P.E. White, Kamloops, continued his field research on carbonatite deposits, and prospectors he has helped have successfully found and developed major prospects such as the Thanksgiving scheelite and the Top volcanogenic copper-silver.

(3) G. Addie, Nelson, was responsible for stimulating intense prospector activity in his district and the successful exploitation of small deposits.

(4) D. A. Grieve, Fernie, continued the field mapping of the Elk Valley Coalfield, coal quality studies including cooperation with B.C. Research and University of Victoria, and organized a most successful workshop on Crowsnest Coalfield in Fernie.

(5) G. V. White acted as District Geologist at Fort St. John, co-authored a paper on coal rank distribution in the Gething Formation with R. E. Karst, the former District Geologist, and returned to the University of British Columbia to complete his B.Sc. in geology.

A considerable part of the work of the section is devoted to training and aiding prospectors and small developers. Over 400 students were enrolled in basic prospecting courses in 1981 held in 15 localities, and 31 prospectors graduated from the 15-day-long Fifth Annual Mineral Exploration Course held at David Thompson University Centre, Nelson, under the joint sponsorship of the Ministry of Education, Selkirk College, and the Ministry of hergy, Mines and Petroleum Resources.

Staffing changes and shortages made 1981 a difficult year for Applied Programs. With the resignation of E. W. Grove, Manager of Applied Programs early in January, 1981 to go into private practice, the section was left with only two permanent employees in the Victoria office - Joe Novak and Geri Dickson. Arrangements were made to temporarily fill the position by having Tom Schroeter, Gordon White, Gerry Klein, and Vic Preto act as Manager of Applied Programs. Miss Geri Dickson and the above ably directed the field offices and administered the Mineral *Prospectors Act* until the appointment of Fraser Shepherd as Acting Manager in March for the balance of 1981. In addition, R. E. Karst, Fort St. John, resigned in February and G. Ii. Klein, Prince George, in July, although he continued on contract to keep the office open one day a week for consultation.

Geological studies by District Geologists are described in ***Geological Fieldwork, 1981*** (Paper 1982-1).

The budget estimates for Applied Programs Section and Prospectors' Assistance ware as follows: permanent salaries, $327 872; field and other Costs, $202 944; Prospectors' Assistance training, $60 037; grants, $250 000.

RESOURCE DATA AND ANALYSIS

This section, under J. G. McArthur, is responsible for the collection, compilation, interpretation, distribution, and approval of exploration and development data gathered from various sources, thus fulfilling objectives (7) and (8). Most of the information is made generally available after requisite confidential periods, normally 1 to 3 years.

The major files are:

- Mineral Assessment Reports - over 7 900 microfilmed reports available at reader/printers in Vancouver and Victoria.
- Mineral Assessment Report Index - a computerized bibliographic index and map series updated annually.
- MINFILE - a shallow level computerized information system with data on over 8 600 mineral occurrences; statistical data on mineral production and reserves; a companion to the Mineral Inventory Map Series.
- Property Files - open files containing published and unpublished reports and maps (historical) on producers and prospects and filed by NTS.
- Coal Assessment Reports - nearly 500 reports on coal exploration; nonconfidential files are available in Victoria.
- Coal File - a computerized coal exploration data file is being constructed.
- Mineral Deposit/Land-Use Map Series - a series of interpretive mineral potential maps.

The annual volume, ***Exploration in British Columbia,*** is produced by the section coincident with its update of MINFILE.

In addition, the section administers the Portable Assessment Credit account, produces map compilations and mineral potential evaluation studies related to land-use conflicts, and advises on regulations. Field-oriented studies related to industrial minerals and structural materials are also handled by this section.

The results of a major field and office study of aggregate materials of the Lower Mainland and Vancouver Island were published by Z. D. Hora and F. C. Basham. A similar study of aggregates for other parts of the mainland is being compiled. New field programs for silica and barite were started.

Specific site investigations in regard to land-use assessments were carried out largely by District Geologists. The section actively participated on several land-use planning programs. The South Moresby and Slocan Valley planning programs were two of the most active.

The approximate budget of this section, distributed by function, was as follows: Mineral Inventory, $132 396; Coal Inventory, $84 506; Industrial Minerals, $73 005; Mineral Land-Use and Resource Analysis, $97 837; Computers and Consultants, $223 100; Management, $41 812; Total, $652 656. Of this total, $320 338 was for permanent staff salaries.

ANALYTICAL LABORATORY

The Analytical Laboratory, under W. M. Johnson, is responsible for a complete range of analytical work in support of the projects of the Project Geologists and District Geologists of the Branch. It also provides analytical support for the Prospectors' Assistance Program and performs a limited number of free analyses for *bona fide* prospectors holding a valid free miner's licence. Some analytical work is performed for other Government agencies, and laboratory staff act as consultants on a wide range of topics for agencies such as the Consumer Taxation Branch of the Ministry of Finance, the Ministry of Industry and Small Business Development, the Ministry of Highways, the Energy Resources Division of this Ministry, and various commercial and mining laboratories. The laboratory is also responsible for the standards used in the regional geochemical program and the quality control for that program as well as for assistance in its organization and administration. The Chief Analyst, in the capacity as Chairman of the Board of Examiners, is responsible for the certification of assayers in the Province as specified in *the* Ministry *of Energy, Mines and Petroleum Resources Act* (sections 13 through 20). All these activities are performed to carry out the Branch's objectives (9) and (10).

The facilities of the laboratory include comminution and mineral separation equipment, X-ray fluorescence, atomic absorption, gamma-ray and emission spsctrometric instruments, and an X-ray diffractometer. The laboratory is also capable of performing traditional fire assay and wet chemical analyses.

There was a significant amount of method development and research done in the laboratory during 1981. Included in this was a new method for the determination of barium (now in routine use in a commercial laboratory), the analysis of coal liquids, the design and construction of an automatic sample changer, work on geochemical standards, a study of the mineralogy of the Tillicum Mountain gold deposit, and a critical review of the overall data quality of the regional geochemistry program. These studies were as follows:

Development of a New Method for the Determination of Barium in Rocks and Other Geological Materials by M.A. Chaudhry.

Development of Techniques for the Analysis of Coal Liquids by Paul Riehm, Ms. Kathy Colburne (auxiliary staff of this Ministry), and Dr. Paul West of the University of Victoria in close relationship with B.C. Research.

The Design and Construction of an Automatic Sample Changer to Make More Efficient the Increasingly Numerous Whole Bock Analyses Requested of the Laboratory by P. F. Ralph.

Continuing Development of Methodology for the Determination of Trace Elements using X-Ray Fluorescence Techniques by Dr. V. Vilkos.

A Combined Field and Laboratory Study of the Mineralogy of the Tillicum Mountain Gold Deposit by Dr. J. Kwong in conjunction with G. Addie.

The Use of Recently Developed Statistical Techniques for the Evaluation of the Quality of the Data from the Regional Geochemical Survey by Dr. W. M. Johnson.

Participation in Interlaboratory Standard Reference Material Programs including Supplying Sample Material for the Purpose by B. Bhagwanani, M. A. Chaudhry, Dr. W. M. Johnson, and P. F. Ralph.

CERTIFICATION

There were five Certificates of Efficiency in Assaying awarded out of a total of seven candidates.

OUTPUT

wet Chemical and X-Ray Fluorescence Laboratory: there were 1 726 results reported on 707 samples submitted by general prospectors and prospectors' assistance grantees as well as 8 847 results reported on 1 204 samples submitted by Ministry personnel.

Emission Spectrographic Laboratory: there ware 35 698 semi-quantitative determinations made on 1 215 samples and 1 499 quantitative results on 530 samples.

X-Ray Diffraction Laboratory: there were 744 mineral identifications made and 40 quantitative mineral determinations.

Mineral Separation: there ware 76 mineral separates prepared for subsequent analytical work.

Sample Comminution: a total of 1 783 samples were received and prepared, 648 from prospectors and 1 135 from Ministry personnel.

The output of the laboratory was comparable with 1980, greater in some categories, less in others. Where decreases occurred they were roughly proportional to the decrease in geological staff caused by vacancies.

BUDGET

The laboratory's budget was $251 652 for permanent salaries, $51 500 for supplies and equipment, and $84 800 for travel, special services, temporary salaries, and miscellaneous.

PROFESSIONAL ACTIVITIES

The staff of the Branch was active during 1981 in professional activities related to their work, including organizing and attending scientific meetings, field visits, and executive activities in societies.

During the year the staff played major roles in organizing four meetings and important roles in two others.

(1) Workshop on Southeastern British Columbia Coalfields at Fernie, February 11 and 12, organized by District Geologist D. A. Grieve at which one hundred coal geologists from industry and government took part.

(2) Workshop on Computers and Coal at the Empress Hotel in Victoria, March 25 to 27, organized by Candace Kenyon at which sixty geologists took part.

(3) Meeting of the Committee of Provincial Geologists at the Delta Hotel, October 19, preceding the Mines Ministers' Conference.

(4) CIM District 6 Annual Meeting at the Empress Hotel and Newcombe Auditorium in which major organizational roles were played by J. G. McArthur, Secretary-Treasurer; A. Panteleyev, Technical Program Chairman; and W. J. McMillan, Tours and Services. A large number of staff ware involved in organizing sessions or were speakers at this meeting. Attendance was over seven hundred.

Two meetings to which staff also made important contributions were the Cordilleran Section of Geological Association of Canada Annual Meeting in February and Gold Symposium held in conjunction with the Society of Exploration Geochemists; both meetings in Vancouver.

Foreign travel for scientific and educational purposes or to stimulate exploration in British Columbia included the following:

(1) A. Panteleyev and T. G. Schroeter travelled in October to MacKay School of Mines, University of Nevada Invitational Research Conference on Zoning in Volcanic and Subvolcanic Mineral Deposits. Both gave papers.

(2) D. G. MacIntyre was an invited speaker at a symposium on Metals in Shales at the Geological Society of America in Cincinnati on November 1 and 2.

(3) W. M. Johnson represented the Ministry in a visit to laboratories and other facilities in Japan as part of the Canadian Coal Liquefaction Coordinating Committee in November.

(4) Z. D. Hora attended the Seventeenth Annual Forum on the Geology of Industrial Minerals held in May in Albuquerque, New Mexico.

(5) A. Sutherland Brown, J. G. McArthur, T. G. Schroeter, and G.P.E. White visited Northwest Mining Association Meeting in Spokane in December. A. Sutherland Brown organized and chaired a session, McArthur and Schroeter gave talks.

Staff involvement in professional affairs included the following:

Canadian Institute of Mining and Metallurgy: J. G. McArthur, Secretary-Treasurer of Victoria Section; A. Panteleyev, Past Chairman of Victoria Section.

Geological Association of Canada: W. J. McMillan, Chairman of Victoria Section; A. Panteleyev, councillor of Cordilleran Section and of Mineral Deposit Division.

Canadian Geoscience Council: A. Sutherland Brown, President elect and member of Committee of Provincial Geologists.

British Columbia Association of Professional Engineers: W. J. McMillan, councillor.

Analytical Chemistry Division of Chemical Institute of Canada: w. M. Johnson, Chairman.

PUBLICATIONS

The work of the Branch is presented to the interested public by a series of formal publications and maps, as wall as by technical talks and informal discussions;

Formal publications prepared by the Division in 1981 include the following:

Papers:

Sand and Gravel Study, 1980, British Columbia Lower Mainland - a comprehensive review of aggregates, by Z. D. Hora and F. C. Basham (Paper 1980-10).

Geological Fieldwork, 1980 - a preliminary account of the work of the Branch presented as soon as possible after completion (Paper 1981-1).

Reconnaissance Rock Geochemistry of Nicola and Kingsvale Groups between Merritt and Princeton, by V. A. Preto (Paper 1981-2).

Bulletins:

Bulletin 66 - Berg Porphyry Copper-Molybdenum Deposit, Geological Setting, Mineralization, Zoning, and Pyrite Geochemistry, by Andrejs Panteleyev, 158pp.

Bulletin 46 - Late Glacial History and Surficial Deposits of the Okanagan *Valley,* by Hugh Nasmith, 54 pp. (Reprinted).

Preliminary Maps:

41 - Geology of the Rock Creek Tertiary Outlier, by B. N. Church (parts of 82E/3E, 2W) (1:50 000).

42 - Geology of the Crowsnest Coalfield, by D. E. Pearson and D. A. Grieve (part of 82G/7) (1:10000).

43 - Geology of Eastern Margin of Shuswap Complex, Frenchman Cap Area, by Trygve Höy and R. L. Brown *(part* of 82M) (1:100 000).

44 - Geology of the Akie River Ba-Pb-Zn Mineral District, by D. MacIntyre (94F) (1:50 000, orthophoto base).

45 - Geology of the Kelowna Tertiary Outlier (East Half), by B. N. Church (part of 82E) (1:50 000).

46 - Geology of the Alpine-Boivin Carbonate-Hosted *Zinc* Occurrences, Southeastern British Columbia, by G. Gibson (parts of 82G/14E and 82J/3E) (1:25 000).

47 - Nicola Project, Merritt Area, by W. J. McMillan (parts of 92I/2f, 2g, 2h) (1:25000).

other *Maps and Data Issued:*

Regional Geochemical Surveys 5 and 6:
BC RGS-5, NTS 93A - Quesnel Lake.
BC RGS-6, NTS 93B - Quesnel.
Scale 1:250 000 - 13 elements in silts, 2 + pH in water.

Other Maps and Data Issued (Continued):

Mineral Deposit/Land-Use maps, 92H Hope and 921 Ashcroft, by J. E. Forester.

Regularly updated maps and data in the following series are available:

Mineral Inventory Maps (issued as ozalid prints) - show location and commodities of all known mineral deposits.

Mineral Assessment Report Index Maps - show the location and number of reports accepted for assessment credit by the Ministry.

MINFILE - a revised and updated output of MINFILE made available during 1981.

Works published in external refereed and technical journals and for technical meetings in 1981 include the following:

Brown, R. L., Fyles, J. T., Glover, J. K., Höy, T., Okulitch, A. V., Preto, V. A., and Read, P. B.: Southern Cordillera Cross-Section, Cranbrook to Kamloops, Field Guides to Geology and Mineral Deposits, 1981 Annual GAC/MAC/CGU Meeting, Calgary, *Geol. Assn.* Canada, pp. 335-372.

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Höy, T., Fdmunds, F. R., Hamilton, J. M., Hauser, R. L., Muraro, T. W., and Ransom, P. W.: Lead-Zinc and Copper-Zinc Deposits in Southeast British Columbia, Field Guides to Geology and Mineral Deposits, 1981 Annual GAC/MAC/CGU Meeting, Calgary, *Geol. Assn. Canada,* pp. 41-67.

Johnson, W. M. and Maxwell, J. A.: Rock and Mineral Analysis, 2nd Edition, A Wiley-Interscience Publication, Vol. 27, *John Wiley & Sons, New* York, 489 pp.

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McArthur, J. G.: Year Two in a Decade of Mineral Expansion in British Columbia, *Northwest Mining Assn.,* Proceedings, Spokane, Washington.

McMillan, W. J.: Workshop on the Geology of Southeastern British Columbia Coalfields (Fernie, February), *Geoscience Canada,* Vol. 8, No. 3, pp. 130, 131.

McMillan, W. J. and Johan, Z.: Rock Geochemistry, Geology, and Genesis of the Guichon Creek Batholith, Proceedings, Symposium on Mineral Deposits of the Pacific Northwest, U.S.G.S., Open File Report 81-355, pp. 84-105.

Pearson, D. E. and Creaney, Stephen: Reflectance of Carbonized Vitrinites as a Measure of Oxidation of a Coking Coal, *Fuel*, Vol. 60, No. 3, March 1981, pp. 273-275.

Ralph, P. F.: Automation System for Analytical Instruments, Proceedings, Thirteenth Annual Symposium and General Meeting (Cambrian College, Sudbury, October), Canadian Mineral Analysts, pp. 115-143.

Plate I. Manuscript Preparation at Word Processor.

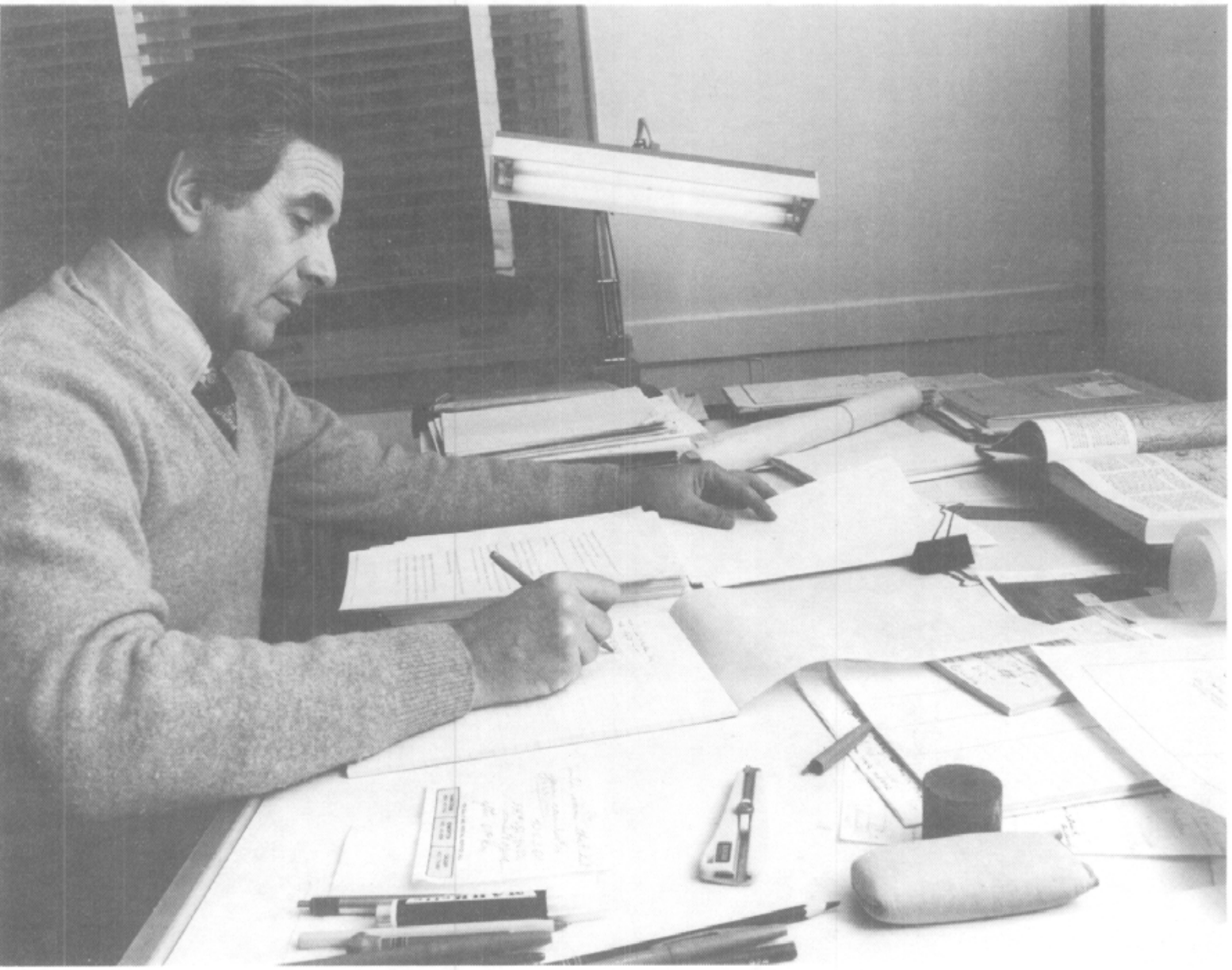

Plate II. Manuscript Preparation.

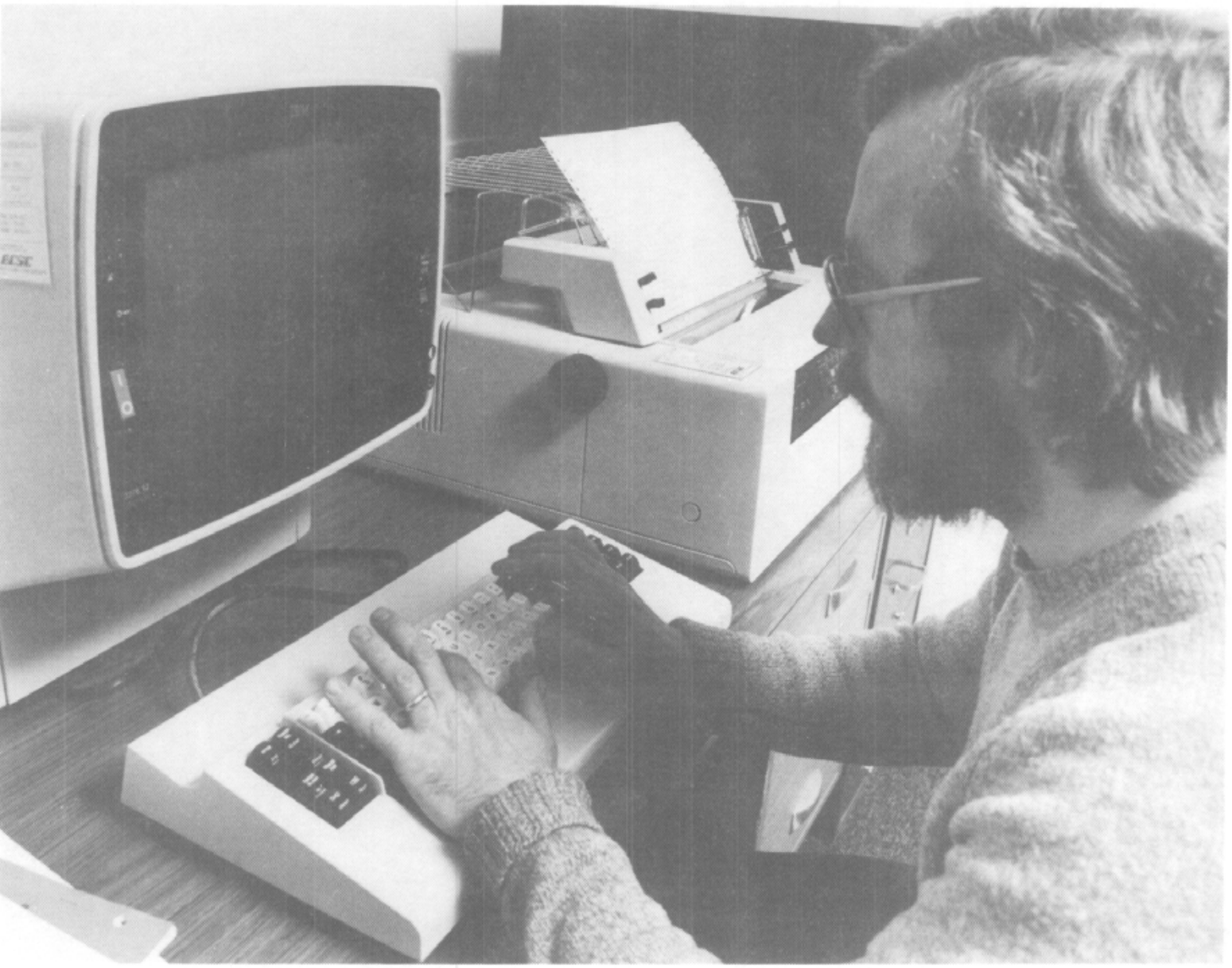

Plate III. Computer Calculations.

Plate IV. Map Preparation.

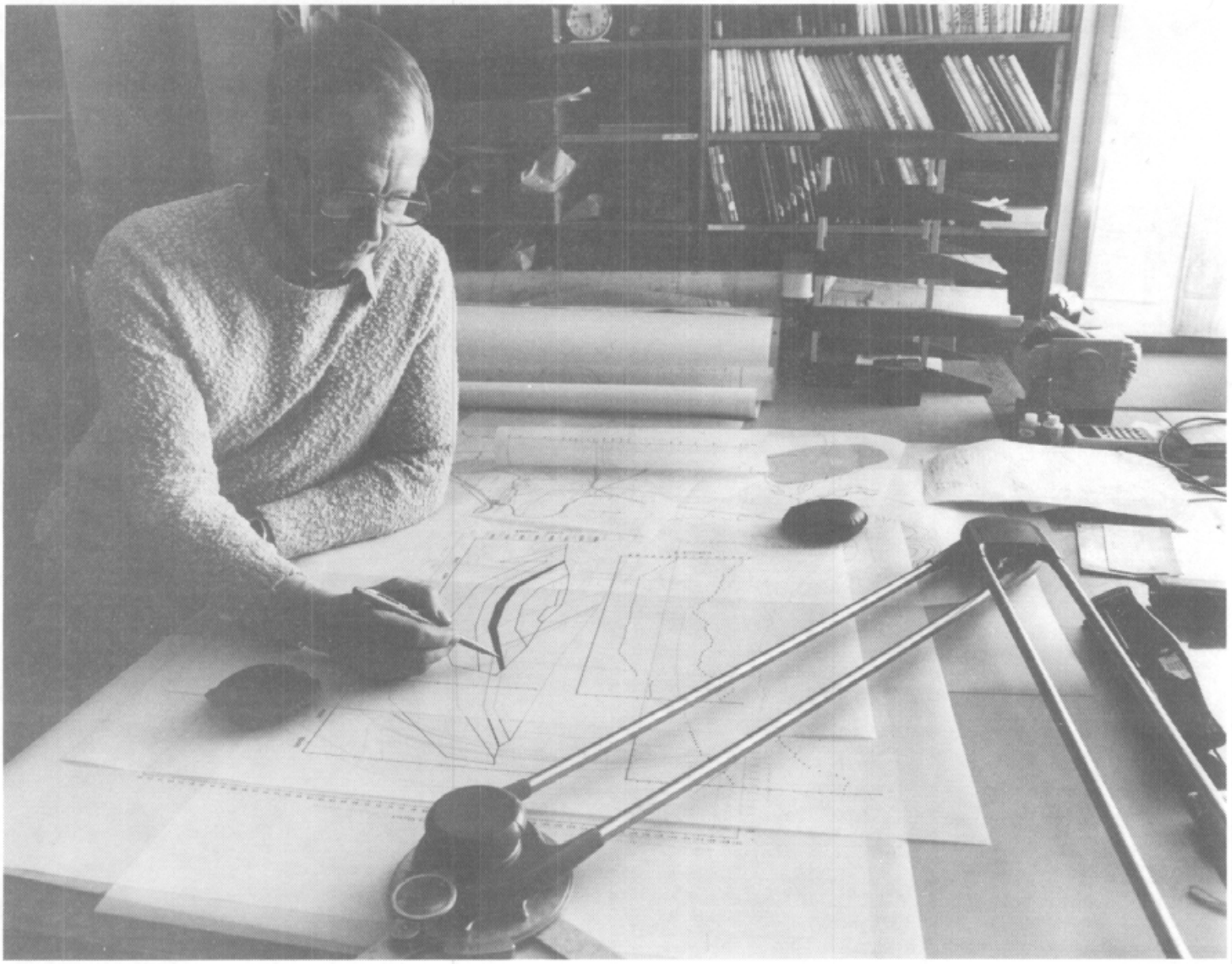

Plate V. Graphic Calculation.

Plate VI. Petrographic Studies.